

In it he treats of the errors of three standard thermometers constructed for him at the Kew Observatory, and after describing minutely the instruments, the manner in which he verified the accuracy of the positions of the fixed points, and the appliances he used in the work, proceeds to state that he then rigorously examined the thermometers for errors depending on calibration. Of these he says: "The results of our calibration are given in the following table. The observations were made with Apparatus II., and special care was taken to guard against any changes of temperature. The reduced results are as follows, where each line is the mean of three observations:—

Thermometer.	Date.	Extreme readings.	Computed length of col.	Correction for calibration error.
Kew, 578	1880. Oct. 15	- 1° 1' + 33° 6' + 31° 0' + 65° 1' + 63° 7' + 98° 6'	32° 487 32° 507 32° 487	At 32° C. = +0° 007 65° C. = -0° 014 99° C. = +0° 007
Kew, 584	Oct. 15	+ 32° 2' + 82° 3' + 76° 1' + 127° 3' + 119° 1' + 170° 1' + 162° 2' + 213° 2'	49° 040 49° 068 49° 078 49° 060	79° F. = +0° 021 123° F. = -0° 006 166° F. = -0° 016 212° F. = +0° 001
Kew, 585	Oct. 15	- 1° 0' + 50° 9' + 49° 0' + 100° 9' + 99° 1' + 151° 7' + 148° 9' + 201° 0' + 199° 2' + 250° 8'	49° 813 49° 843 49° 820 49° 807 49° 747	50° C. = +0° 015 100° C. = 0° 000 150° C. = +0° 008 200° C. = +0° 029 250° C. = +0° 110

REMARKS.—The observations were all made by daylight, and at one sitting for each thermometer. The extreme variations of the temperature of the room during the observations as measured by two thermometers, one at each end of the tube being measured, were as follows:—

Kew, 578 = 0° 0 F.
584 = 0° 1 F.
585 = 0° 1 F.

The length of the column used for the Kew calibration, and by which the thermometers were graduated, was 5° 026 C. for Kew 578, 10° 405 F. for 584, and 10° 673 F. for Kew 585. We may therefore conclude that between 0° and 100° C. the errors of the three Kew standards depending on the calibration are practically insensible; for the errors shown above are too small to be certainly detected, owing to the width of the lines which make up the graduation of the thermometer scales.

Accidental errors of graduation could not be guarded against except by the direct examination of every degree, and that accordingly has been done.

The tedious examination of each degree was accomplished with the aid of Prof. J. E. Kershner. We used the apparatus I., and each degree was measured twice. The resulting means were expressed in terms of hundredths of one division of the eye-piece micrometer, and gave a subdivision of about $\frac{1}{2330}$, $\frac{1}{2330}$, and $\frac{1}{2330}$ of 1° in the cases of Kew 578, 584, and 585 respectively. There were about 2300 separate micrometer readings made, and the result of the reductions shows that no sensible accidental errors have been introduced into the graduations of these standards.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIDGE.—The latest edition of the schedule of subjects for the Moral Sciences Tripos fully recognises physiology. In the advanced part of the examination special knowledge is required (1) of the physiology of the senses and of the central nervous system; (2) of experimental investigations into the intensity and duration of psychical states; and (3) of such facts of mental pathology as are of psychological interest. Questions will also be set relating to the philosophic treatment of the relation of body and mind as regards both the method and the general theory of psychology. Mr. Lewes's "Problems of Life and Mind," vols. iii.-v., Dr. Michael Foster's "Text-book of Physiology," Book iii., Wundt's "Physiologische Psychologie," Fechner's "In Sachen der Psychophysik," Maudsley's "Physio-

logy of Mind" and "Pathology of Mind" are among the books recommended.

MR. J. M. H. MUNRO, D.Sc. Lond., F.C.S., has been elected resident Professor of Chemistry in the Wilts and Hants Agricultural College, Downton, Salisbury, and he will act in co-operation with Prof. A. H. Church, M.A. Oxon. Dr. Munro headed the list in first-class honours in chemistry at both of the examinations for the B.Sc. degree, and obtained the chemical exhibition of the University in 1874. He was also classed in botany and vegetable physiology, and in logic and moral philosophy, and took the Doctor's degree in 1877. He recently received a grant from the Chemical Society in aid of a research on which he is at present engaged.

SCIENTIFIC SERIALS

THE *Proceedings of the Royal Irish Academy* ("Science"), part 5, vol. iii., series II, December, 1880, contains—W. R. Roberts, on the satellite of a line meeting a cubic.—A. H. Anglin, mathematical notes.—Prof. J. P. O'Reilly, on the directions of main lines of jointing observable in the rocks about the Bay of Dublin, and their relations with adjacent coast-lines;—also on the correlation of the lines of faulting of the Palamow coal-field district, Northern India, with the neighbouring coast-lines.—Prof. E. Davy, preliminary report on some new organic nitroprussides.—Prof. W. King, preliminary notice of a memoir on rock-jointing in its relation to phenomena in physical geography and physical geology.—J. F. Knott, on some anomalies in human anatomy (woodcuts).—Prof. Mackintosh, note on the occurrence of a premaxillo-frontal suture in the skull of the koala (*Phascolarctos cinereus* (with plates 10 to 13)).—G. H. and G. A. Kinahan, euries or basic felstones of Silurian age.—G. H. Kinahan, supposed Upper Cambrian rocks in the counties of Tyrone and Mayo.

THE *Proceedings of the Royal Irish Academy*.—"Polite Literature and Antiquities," part 2, vol. ii. series II, December, 1880, contains the following papers of interest to the student of nature:—W. Frazer, description of a great sepulchral mound near Donnybrook (in Co. Dublin), containing human and animal remains, as well as some objects of antiquarian interest referable to the tenth or twelfth centuries (woodcuts).—G. Allmann Armstrong, particulars relative to the finding of human remains in the neighbourhood of Dundalk (woodcut).—R. J. Ussher and G. H. Kinahan, on a submarine crannog at Ardmore, Co. Waterford (plate 1 and woodcut).—Thos. Plunkett, on an ancient settlement found about twenty-one feet beneath the surface of the peat in the coal-bog at Boho, Co. Fermanagh (plate 2).

THE *Scientific Proceedings of the Royal Dublin Society*, vol. ii. new series, part vii., November, 1880, contains:—V. Ball, on the mode of occurrence and distribution of diamonds in India.—A. B. Wynne, on some points in the physical geology of the Dingle and Iveragh Promontories.—Dr. C. A. Cameron, on the action of water upon mercuric sulphate.—J. H. Luby, voluntary act of self-destruction by the worker bee.—G. F. Fitzgerald, F.I.C.D., notes on fluorescence.—Thos. Plunkett, on chert in the limestone of Knockbeg, county of Fermanagh (woodcut).—R. M. Barrington, M.A., on the introduction of the squirrel into Ireland (with a map).

Vol. iii., new series, part i., January 1881, contains:—C. E. Burton and Howard Grubb, on a new form of ghost micrometer for use with astronomical telescopes (plates 1 to 4).—E. T. Hardman, on a travertine from Ballisodare near Sligo, containing a considerable amount of strontium.—W. Smith, preliminary note on the manufacture of paper from melic grass (*Molinia caerulea*).—D. M'Arde, On some new or rare Irish Hepaticæ (with plates 5 and 6).—Percy Evans Freke, on North American birds crossing the Atlantic (with tables).

Journal and Proceedings of the Royal Society of New South Wales, vol. xiii., 1879 (Agents in London Messrs. Trübner and Co.), contains—On the "gem" cluster in Argo, by H. C. Russell.—On the water of Sydney Harbour, by the Rev. W. H. Sharp.—On the anatomy of Distichopora, with a monograph of the genus, by Rev. J. E. Tenison-Woods (two plates).—On the geological formations of New Zealand compared with those of Australia, by Dr. Jas. Hector.—On the languages of Australia in connection with those of the Mozambique and of the south of Africa, by Hyde Clarke.—On *Ottelia praterita*, F. v. M., by Baron von Müller, with a plate (an alisma-like leaf-impression from the green-bush quarry near to Parramatta, apparently allied

to *Ottelia ovalifolia*).—On a compiled catalogue of latitude stars, epoch 1880, by H. S. Hawkins.—On the occurrence of remarkable boulders in the Hawkesburg rocks, by C. S. Wilkinson.—On the Wentworth hurricane, by H. C. Russell.—Abstract of the meteorological observations taken at the Sydney Observatory, by H. C. Russell. (January to December, 1879).

American Journal of Science, December, 1880.—Note on the zodiacal light, by H. C. Lewis.—The early stages of renilla, by E. B. Wilson.—Geological relations of the limestone belts of Westchester, co. New York, by S. D. Dana.—Abstract of some palæontological studies of the life-history of *Spirifer brevis*, H, by H. S. Williams.—Index to vols. xi.-xx.

Journal of the Franklin Institute, January.—Experiments with the Parkins machinery of the steam yacht *Anthracite*, by Chief-Engineer Isherwood.—The determination of silicon and titanium in pig-iron and steel, by Dr. Drown and Mr. Shimer.—An adaptation of Bessemer plant to the basic process, by Mr. Holley.—The value of the study of the mechanical theory of heat, by Mr. Wolff.—Blasting, by Mr. Kirk.—On the wholesomeness of drinking-water, by Mr. Haines.—An inquiry into the laws of the beautiful in music, by Prof. Clarke.

THE last number of the *Journal of the Physical and Chemical Society* (Russian) contains, besides minutes of meetings, papers on the electrolyse of formic and mellitic acids, by M. N. Bunge.—On the variations of the quantity and pressure of oxygen in the lungs, by Prof. Ivan Setchenoff.—On products of the decomposition of albuminous matters, by Dr. Danilevsky.—On hops, by M. Tchekkh; and several smaller notes on organic chemistry.—In the physical part, M. Shvedoff continues his researches on hail, trying to establish by various very interesting arguments the cosmic origin of hail, which he considers as a variety of meteorites.—M. Reinboth describes a new naphtha barometer which has a great sensibility.—M. Van der Flith gives several new mathematical formulæ concerning electrodynamics.

THE *Schriften der physikalisch-ökonomischen Gesellschaft zu Königsberg* (1879, i. and ii.; 1880, i.).—These parts contain the following papers:—On the *Uredo* fungus, by Dr. Caspary.—On the Gastræa theory, by Prof. Kupffer.—On pisciculture, by Dr. Seidlitz.—On some acoustical and optical experiments with the telephone, by Prof. Berthold.—On the phonograph, by Dr. Zenker.—On the ancestors of carnivora, by Dr. Albrecht.—What is species, and what variety? by Dr. Caspary.—On bacteria, by Dr. Baumgarten.—On the observations made at the station for measuring the temperature of the soil in various depths at the Botanical Gardens at Königsberg, by Prof. E. Dorn.—On some periodical phenomena in inorganic nature, by Dr. Jentsch.—On the ancestors of hoofed animals and Edentata, by Dr. Albrecht.—On the rhythmical motions in the animal and in the human body, by Prof. Grünhagen.—On the fauna of New Zealand, by Prof. Zaddach.—On the archæopteryx, by Prof. Zaddach.—On the ancestors of rodentia, by Dr. Albrecht.

Bulletin de l'Académie Royale des Sciences (de Belgique), No. 12, 1880.—Application of the tuning-fork to study of the propagation of sound and vibratory movements in liquids, by M. Montigny.—On the falling stars of November 27, 1880, observed at Brussels Observatory, by M. Houzeau.—On two plesiosaurs of the lower lias of Luxembourg, by M. van Beneden.—Science and the imagination (lecture at public séance), by M. Stas.—Voyages and metamorphoses of a drop of water, by M. Van der Mensbrugghe.—Announcement of the results of prize competitions.—Reports on memoirs, &c.

Rivista Scientifico-Industriale, No. 1, January 15.—Singular verticillate configuration (in the form of a rose) of the laminae of crystallised water, by Prof. Bombicci.—On storms, by Prof. Cantoni.—A modification of the Ruhmkorff coil, by Dr. Scarpa and S. Baldo.—Two new species in the Mediterranean fauna, by Prof. Richiardi.—Some ammonites of the middle lias, by S. Canavari.—Paramagnetism and diamagnetism of liquids, by Prof. Marangoni.—Experiments proving that air saturated with moisture is an insulator as well as dry air, by the same.

Journal de Physique, January.—Atmospheric absorption of ultra-violet radiations, by M. Cornu.—Experimental researches on the psychrometer, by M. Macé de Lépinay.—On the division of instantaneous currents, by M. Brillouin.—Electric *explorateur* of M. Trouvé, by M. Guriel.—M. Trouvé's apparatus for examination of deep natural or artificial cavities, by the same.—On resultant sounds, by M. Nicotra.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, February 3.—Prof. Owen read a third part of his description of the great extinct horned lizard of Australia (*Megalania prisca*). The materials had been transmitted from the same formation and locality-petrified drift-bed of King's Creek, Queensland, as the subjects of Part 2, and were discovered by Mr. Geo. Fred. Bennett, about thirty feet from the fossil skull. They proved to be, when recomposed, the opposite extremity of the animal, and consisted of an ossified sheath of the tail, in annular segments supporting conical cores of horn-like weapons. Of these segments the three terminal ones had coalesced; a fourth detached segment fitted the antepenultimate ring. Each ring, save the last, supported two pairs of horn-cores, of which dimensions were given and drawings exhibited of the natural size. From tip to tip of the dorsal pair of the antepenultimate segment measured ten inches. In this segment was included the corresponding vertebra, exemplifying the caudal modifications of the type of the dorsal, sacral, and other vertebrae of *Megalania* described in the parts communicated to the Royal Society in 1858 and 1880. The author then entered into an exhaustive review of analogous caudal armatures in other animals. The nearest approach, in the class *Reptilia*, was made by the small existing Australian lizard (*Moloch horridus*) and by the *Uromastix principis*, recently described by the late Arthur W. E. O'Shaughnessy, of whom Prof. Owen spoke in terms of deep regret and respect.

The supports of the caudal horns or spines in the above small lizards retained the immature condition of fibro-cartilage. Examples where histological development had proceeded to ossification were cited from recent and fossil *Reptilia*. In the latter the nearest approach to the caudal armature of *Megalania* was presented by the *Scelidosaurus*, of the Dorsetshire lias. A still nearer resemblance to the singular structures described in the present paper was made by certain extinct species of gigantic armadillos, e.g. *Glyptodon asper*, from South American tertiaries.

The author associated this repetition or lingering of a reptilian osteodermal character in the mammalian class with the previously-known repetition of the horny scutation of lizards in the mammalian pangolins (*Manis*); he referred to the low dental condition in the numerous similar simple teeth of armadillos and the still lower characters which had suggested the ordinal term "Edentata." He cited the tenacity of life and long continuance of the muscular irritability after death in the sloths; the winter sleep of bats and certain rodents, with their faculty of circulating blood in the venous state; the quills in hedgehogs and porcupines as indicative of a repetition of a dermal character of an oviparous class; the anatomical modifications giving a faculty of flight, as in Pterosaurians.

The sole common organic character of, and peculiar to, such members of a large and otherwise much varied group of mammals was a cerebrum, small, not extending upon the cerebellum, smooth or with few and simple convolutions, but with the hippocampal commissure ascending to connect the hemispheres above the lateral ventricles, and so constituting the anthropotomical "corpus callosum." A still lower group of mammals had no such commissural development, but this common cerebral character was associated with as many and great variations of inferior structures as in the *Lisencephala*. The *Lyencephala* included the marsupials and monotremes.

In the discussion which followed the reading of the paper the chief objection was an averment that the author had no evidence of its subjects having belonged to *Megalania prisca*, and that they were more probably parts of some Chelonian reptile.

To this the author replied that he had evidence both negative and positive. From the year 1857 he had received parts of the skeleton of a great terrestrial reptile from localities hundreds of miles apart in the provinces of New South Wales, Victoria, Queensland, but not a single fragment of a carapace, plastron, or other characteristic part of a Chelonian; every large reptilian fossil was not only "Lacertian," but of the very genus and species *Megalania prisca*. Perhaps no part of the axial skeleton was more differentiated than the occipital vertebra in a lizard and a tortoise. In the latter the elements remained as distinct as in a fish; in the former as confluent as in the mammal; this at least was the case in *Moloch* as it is in *Megalania*. Finally Prof. Owen pointed to the vertebra in organic connection with the tail-sheath in the fossils last received; it was Lacertian, not Chelonian.